



FOREST HEALTH PROTECTION

Pacific Southwest Region

South Sierra Shared Service Area

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2005 Insect and Disease evaluation of Breckenridge Mountain and the Piute Mountains, Sequoia National Forest.

Introduction

During the week of June 6, 2005 Forest Health Protection personnel (Dave Schultz and Beverly Bulaon, entomologists; Pete Angwin, pathologist) met with staff members (Jeanna Childers, Steve Anderson, and Dave Freeland) of the Greenhorn/Cannell Meadows Ranger district and from the Forest Supervisor's Office (Tom Simonson and Lew Jump) of the Sequoia National Forest to address insect and disease activity primarily in the Piute Mountains and Breckenridge Mountain areas. Both locations are being considered for fuels reduction and forest health improvement projects. The district requested a landscape assessment to determine the extent and severity of mortality from recent bark beetle activity and disease presence, and subsequent effects that may occur to the existing stands.

One main priority for the district is the retention of protected activity centers (PAC) for California spotted owl (*Strix occidentalis occidentalis*) within the mountains. PAC habitat requirements conflict with current management alternatives to reduce and prevent insect and disease activity, and wildfire. The dilemma exists that most treatment options on these PACs and their surrounding areas would not only degrade preferred owl habitat, but cause present owl residents to vacate, with a strong possibility of not returning. A "no action" strategy would be risky since these stands – in their current condition, are highly susceptible to burning at stand-replacing intensities rather than low ground fires.

In 1992, John Wenz (entomologist) and John Pronos (pathologist) conducted biological assessments on the Breckenridge compartment. Wenz conducted a more recent evaluation of the Piute Mountains in 2003. Reviews of their evaluations indicate that natural stand conditions have changed little since then; thus, their management suggestions are still fitting.

This report summarizes our general observations on Breckenridge Mountain and the Piute Mountains, with references to these past evaluations. We present general management strategies to dealing with insects and diseases, and suggestions for alternatives in addressing PAC, fuels reduction, and future forest health.

Breckenridge Mountain

Of concern on and around Breckenridge Mountain (also referred to as Breckenridge compartment in Wenz and Pronos, 1992) were the wildland urban interfaces and high-frequency use areas like campsites and trails. A small community of houses at the top of the mountain is nestled in dense surrounding vegetation and forest composed mainly of large-diameter Jeffrey pine, white fir, and sugar pine, interspersed with California black oak. Along Mill Creek trail, much of the stand is open with many of the trees at greater than 20 inches DBH. It appears a low intensity fire was applied along the trail a few years ago, as evidenced by the scarce amount of brush and tree scars. The topography along the trail is very steep, with rocky outcroppings scattered throughout (see Figure 1). Many fir trees of various size classes, appeared to have died within the last five years. Of the remaining green trees, most had top-kill or showed symptoms of (true and dwarf) mistletoe infection. Golf Meadow Campground was also experiencing white fir top-kill and evident mortality, with (annosum) root disease detected in Jeffrey pine stumps. Small Jeffrey pine plantations scattered around the mountain, were also examined.



Figure 1. Mill Creek Trail on Breckenridge Mountain.

Piute Mountains (Clear Creek Drainage)

To date, this watershed has lost and is losing about 50% of its old-growth white fir and some Jeffrey pine based on aerial detection surveys and ground examinations. All ages and size classes of white fir were found dead or dying. Top-kill and true mistletoe infection are prevalent in remaining live white fir. The extent of mortality of white fir was very evident looking across Browns Meadow and Liebel Peak (see Figure 2).



Figure 2. White fir mortality observed along Liebel Peak in the Piute Mountains.

Jeffrey pine mortality is more scattered in the Piute, rather than clustered in groups that signify either root disease or bark beetle infestation. Claraville and French Meadow are wildland-urban-interface areas that are predominantly composed of Jeffrey pines with black oak trees mixed. Understory regeneration and brush are heavy in places where stands are not overstocked.

Insect and Diseases

The fir engraver (*Scolytus ventralis*) is associated with white fir mortality and top-kill. Of the remaining live white fir, most showed symptoms of stress: branch dieback, foliage discoloration, and infection with western dwarf mistletoe, *Arceuthobium abietinum* f.sp. *concoloris* or true mistletoe, *Phoradendron bolleanum* subsp. *paciflorum*.. California flatheaded borer (*Melanophila californica*) was the primary insect found attacking Jeffrey pine. Although not found during this visit, there is a good possibility that Jeffrey pine beetle (*Dendroctonus jeffreyi*) was also associated with some of the Jeffrey pine mortality. Evidence of red turpentine beetles (*Dendroctonus valens*) was also found at the base of some trees, but was not directly connected with any tree mortality.

Symptoms and signs of annosus root (*Heterobasidion annosum*) disease were found in Golf Meadow campground in Breckenridge, and an unmarked campground in the Piute. This disease infects nearly all conifers in California; as a result, it is widespread in distribution and can be found in many areas. Root disease centers were most visible wherever Jeffrey pines were predominant.

Discussion and Recommendations

Insect and disease activity in Breckenridge and Piute Mountains have been on going since 1999 when mortality was first detected. Comparisons of those aerial surveys show that mortality peaked in 2003 and declined in 2004. As seen from the ground, about 90% of the white fir component has been killed or is in serious decline in the areas examined. Despite the high amount of mortality, bark beetle outbreaks are not unusual in this area, and have historically

occurred at regular intervals. An estimate of mortality of Jeffrey pines is about 30%, however, some green trees examined on the ground were successfully attacked last year, but were not showing crown symptoms yet. In 2003 Wenz stated that mortality appeared to have been increasing over the last three to four years, with nearly 15,000 acres affected in the Piute Mountains alone (Wenz 2003). Based on his evaluation, mortality appeared to be about 75% to 80% white fir and 20% to 25% Jeffrey pine. As of present, much of the bark beetle activity (particularly fir engraver) has subsided due to the decline of favorable host trees. However, dwarf mistletoe levels in white fir will gradually intensify on currently infected trees and spread to neighboring ones.

At the landscape level, basal areas are relatively high (live and dead trees), vegetation fairly dense, and a large percentage of stands overstocked. Older and recently dead trees were found in close groups scattered around the mountain. Looking across at adjacent hillsides, characteristic patterns of mortality and stress were observed in white fir. Weather stations around the area showed averages of 59% to 84% below normal during 1999-2002 (Wenz 2003). The prolonged drought stress and intense resource competition between trees probably predisposed them to mass beetle attack.

The probability for catastrophic wildfires or prolonged insect and disease activity in these same locations is high. In concurrence with previous reports: if current stand conditions and prevalence of dwarf mistletoe remain constant, there is good possibility that insect and diseases will continue to be a chronic issue in these areas. Strategies for improving forest health and reducing fire hazard should concentrate on decreasing stand density, treating freshly cut stumps with a registered borate compound, and removing dead trees.

If the stands do not burn in the near future, the following stand changes would be predicted to occur on Breckenridge Mountain within a decade: Most of the older white fir on Breckenridge Mountain will die and add to the fuel load. An additional 25% of the larger or older Jeffrey pine will die. The crown closure will be reduced and much of the old-growth character will be lost. Along the Golf Meadow Road the Jeffrey pine plantations are beginning to slow in growth and will begin to experience mortality. The residual clumps of larger and older pines will experience mortality during the next drought. Older white fir will die or windthrow around the campground and along the access road to the electronic facilities on Breckenridge Mountain.

The situation in the Piute Mountains is more critical due to lower annual precipitation. Much of the old-growth overstory appears dead. White fir will continue to fade for several years due to lingering infestations of borers. The densely stocked understory will experience mortality during the next drought. The California flatheaded borer will continue to pick off overstory Jeffrey pine. Annosus root disease pockets in both fir and pine will provide reservoirs for beetle populations during periods of adequate soil moisture. In the absence of fire or thinning, the prognosis for the Piutes is thickets of smaller size-class trees that experience waves of mortality during droughts.

Preserving owl PACs is of top priority for the district. Prudent management strategies would consider delineating which PACs to preserve from known boundaries, then selecting surrounding areas to treat. The following are brief discussions of some suggestions that could be incorporated for mitigating insect/disease effects and restoring forest health. All suggestions pertain to Breckenridge Mountain and the Piute Mountains. Since the mortality of white fir and

presence of disease is widespread across both areas, it would be efficient to evaluate them at the landscape scale, rather than site specific.

1. **Thinning.** Decreasing between-tree competition and opening up stands increase tree vigor, making them more able to withstand bark beetle attacks or disease infection. Thinning changes other environmental factors like temperature and wind movement within stands to conditions that are unfavorable for bark beetles. Thick understory vegetation, such as manzanita or deer bush, are additional sinks that compete for water and nutrients. Brush clearing would free up limited resources, in addition to reducing ignition and ladder fuels. Jeffrey pine beetle, while not typically aggressive, could reach elevated levels if there is an abundance of susceptible hosts available. Freshly created conifers over 14 inches in diameter should be treated with a registered borate compound to prevent creation of new annosus root disease centers.
2. **Stand conversion/Species diversity.** Bark beetles and some diseases thrive in areas where host species are dominant and dense. Regulation of species composition by promoting diversity decreases the likelihood of bark beetle group killing or defoliator preference. Recommendations would be planting more pines in areas where fir has invaded or decreasing the proportion of fir in stands.
3. **Sanitation/disease management.** Removal of trees showing obvious signs and symptoms of reduced growth will reduce the availability of hosts susceptible to bark beetle kill or disease spread. While controlling dwarf mistletoe in white fir is difficult, steps can still be implemented to prevent its spread. Pruning or removal of heavily infected trees should be considered.
4. **Buffers.** Creating mosaics of forest composition and structure not only help to reduce insect and mistletoe distribution, but also contribute to decreasing vertical fuel loads and providing varied habitat for wildlife. Buffers need not necessarily be clearcuts or plantations. Meadows being encroached by pines or firs should be retained as meadows, including any other openings that are being slowly altered or forested. The existing infrastructure such as roads, campgrounds and other facilities can be the focal points for some treatments such as shaded fuel breaks or safety zones for residents of the WUI. It may also be possible to alter the outcome of fire near the PACs by using shaded fuelbreaks near the boundaries to slow the spread of fire into or out of the PACs.

While a “No Action” alternative may be beneficial for preserving owl PACs in the short-term, surrounding areas are still vulnerable to continued insect/disease infestations and severe wildfire events. There is high risk of other bark beetles to infest remaining trees and disease presence to intensify, if no action is taken to thin dense stands or manage the vegetation. Above-normal levels of mortality can continue to be expected if stand conditions are not altered that are conducive to insects/diseases. However, other factors (recreation, other wildlife, aesthetic appeal, etc.) must also be considered that contribute to deciding upon a course of action that meets resource management objectives and values.

Given the above considerations, timely treatments applied where feasible and economical would greatly improve current conditions. The degrees these strategies are implemented directly affect the degree they remain susceptible to insects and disease. Complete and thorough execution of treatments is necessary to assure their effectiveness. Biological analyses can be performed by Forest Health Protection that provide more detailed recommendations than the ones presented here, once the district has identified specific locations in which they feel are of highest priority.

It was a pleasure meeting with everyone and viewing such unique ecosystems that exist in the southern Sierra Nevada. We hope our visit and information here was helpful. If Forest Health Protection may be of further assistance, please do not hesitate to call.

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